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REMARKS

This is intended as a full and complete response to the Final Office Action dated March 2, 2005, having a shortened statutory period for response set to expire on June 2, 2005. Please reconsider the claims pending in the application for reasons discussed below.

Claims 1-33 remain pending in the application. Claims 1-33 are rejected. Reconsideration of the rejection of claims 16-20, 23, and 26 is requested for reasons presented below.

Applicants propose canceling claims 1-15 and 21-33 and rewriting claims 16, 23, and 26 in independent form. Applicants submit that the changes proposed herein reduce the issues for appeal and do not introduce new matter.

Claims 1, 2, and 4 stand rejected under 35 U.S.C. § 102(e) as being anticipated by *Kang, et al.* (U.S. Patent No. 6,139,700). Applicants submit that the rejection of claims 1, 2, and 4 is moot as Applicants propose canceling claims 1, 2, and 4.

Claims 10-13 stand rejected under 35 U.S.C. § 102(e) as being anticipated by *Kang, et al.* (U.S. Patent No. 6,139,700). Applicants submit that the rejection of claims 10-13 is moot as Applicants propose canceling claims 10-13.

Claims 3, 5, and 6 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over *Kang, et al.* (U.S. Patent No. 6,139,700). Applicants submit that the rejection of claims 3, 5, and 6 is moot as Applicants propose canceling claims 3, 5, and 6.

Claims 7-9 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over *Kang, et al.* (U.S. Patent No. 6,139,700), as applied to claim 1 above, and further in view of *Kang, et al.* (U.S. Patent No. 6,287,965). Applicants submit that the rejection of claims 7-9 is moot as Applicants propose canceling claims 7-9.

Claim 14 is rejected under 35 U.S.C. § 103(a) as being unpatentable over *Kang, et al.* (U.S. Patent No. 6,139,700), as applied to claim 10 above. Applicants submit that the rejection of claim 14 is moot as Applicants propose canceling claim 14.

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Claims 15-18 and 20 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over *Kang, et al.* (U.S. Patent No. 6,139,700). Applicants submit that the rejection of claim 15 is moot as Applicants propose canceling claim 15.

Regarding claims 16-18 and 20, the Examiner states that *Kang, et al.* teaches a method comprising forming a refractory metal nucleation layer, WN, by serially exposing said substrate to first and second reactive gases, wherein the refractory metal nucleation layer covers the via, and forming a bulk deposition layer on said nucleation layer by employing vapor deposition to bulk deposit a refractory metal contained in one of said first and second reactive gases, wherein the bulk deposition layer fills the via (column 6, lines 13+). Regarding claim 16, the Examiner states that *Kang, et al.* teaches that the refractory metal is tungsten (column 2, lines 65+). Applicants respectfully traverse the rejection of claims 16-20.

Kang, et al. describes a process comprising forming a WN metal barrier layer on a substrate by atomic layer deposition using a tungsten containing precursor (column 2, line 65+). However, Applicants submit that *Kang, et al.* does not describe bulk depositing a tungsten layer on the WN metal barrier layer, wherein the tungsten layer fills vias in the substrate. The lines cited by the Examiner (column 6, lines 13+) as teaching bulk depositing a layer on the WN metal barrier layer describe a cluster tool that can include a "conventional Al(aluminum)-CVD chamber for forming a subsequent metal line, a W(tungsten)-CVD, and a degassing chamber." Applicants submit that *Kang, et al.*'s description of a tungsten CVD chamber on a cluster tool does not provide a teaching or suggestion of forming a bulk tungsten layer on the metal barrier layer or forming a bulk tungsten layer that fills vias in a substrate. Applicants submit that *Kang, et al.*'s description of the cluster tool at best provides a suggestion to deposit an Al line by CVD on the WN barrier layer. Applicants note that *Kang, et al.* describes the cluster tool as including both a conventional Al CVD chamber for forming a subsequent metal line and a W CVD chamber. Thus, while *Kang, et al.* provides a use for the Al CVD chamber, *i.e.*, to form a subsequent metal line, *Kang, et al.* does not provide or suggest a use for the W CVD chamber. Applicants note that one possible use for the W CVD chamber is to deposit the conductive layer 16 (Figures 1A-1C). However, Applicants note that conductive layer 16 is underneath the WN ALD barrier layer 18. Thus, a W

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CVD conductive layer 16 would not provide a bulk deposition layer on a refractory metal nucleation layer formed by serially exposing the substrate to first and second reactive gases, as recited in proposed claim 16. Furthermore, a W CVD conductive layer 16 would not fill the vias of the substrate.

Therefore, *Kang, et al.* does not teach, show, or suggest a method for forming a nucleation layer and a bulk deposition layer on a substrate having a plurality of vias, said method comprising forming a refractory metal nucleation layer by serially exposing said substrate to first and second reactive gases, wherein the refractory metal nucleation layer covers the plurality of vias, and forming a bulk deposition layer on said nucleation layer by employing vapor deposition to bulk deposit a refractory metal contained in one of said first and second reactive gases, wherein the bulk deposition layer fills the plurality of vias, and wherein the refractory metal is tungsten, as recited in proposed claim 16. Applicants respectfully request consideration of proposed claim 16 and allowance of proposed claim 16 and of claims 17-20, which depend thereon.

Claim 19 stands rejected under 35 U.S.C. § 103(a) as being unpatentable over *Kang, et al.* (U.S. Patent No. 6,139,700), as applied above, and further in view of *Kang, et al.* (U.S. Patent No 6,287,965). Applicants respectfully traverse the rejection.

Claim 19 includes the limitations of proposed claim 16. As discussed above, *Kang, et al.* (U.S. Patent No. 6,139,700) does not provide or suggest all of the limitations of claim 16. Applicants further submit that *Kang, et al.* (U.S. Patent No 6,287,965) does not teach or suggest bulk depositing a tungsten layer on a tungsten-containing metal barrier layer, wherein the bulk deposited tungsten layer fills vias in the substrate. As *Kang, et al.* (U.S. Patent No. 6,139,700) and *Kang, et al.* (U.S. Patent No 6,287,965), individually or in combination, do not provide or suggest all of the limitations of claim 16, *Kang, et al.* (U.S. Patent No. 6,139,700) and *Kang, et al.* (U.S. Patent No 6,287,965), individually or in combination, do not provide or suggest all of the limitations of claim 19. Applicants respectfully request withdrawal of the rejection of claim 19.

Claims 21, 22, 24, and 25 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over *Kang, et al.* (U.S. Patent No. 6,139,700), as applied to claim 1 above. Applicants submit that the rejection of claims 21, 22, 24, and 25 is moot as Applicants propose canceling claims 21, 22, 24, and 25.

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Claims 23 and 26 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over *Kang, et al.* (U.S. Patent No. 6,139,700), as applied to claims 21 and 24 above respectively, and further in view of *Kang, et al.*, (U.S. Patent No 6,287,965). Applicants respectfully traverse the rejection.

As discussed above, *Kang, et al.* (U.S. Patent No. 6,139,700) and *Kang, et al.* (U.S. Patent No 6,287,965), individually or in combination, do not provide a teaching or suggestion of forming a bulk tungsten layer on a metal layer including tungsten.

Thus, *Kang, et al.* (U.S. Patent No. 6,139,700) and *Kang, et al.* (U.S. Patent No 6,287,965), individually or in combination, do not teach, show, or suggest a method for forming a nucleation layer and a bulk deposition layer on a substrate disposed in a processing chamber, said method comprising forming a refractory metal nucleation layer by serially exposing said substrate to a boron-containing compound and a tungsten-containing compound, wherein serially exposing said substrate to the boron-containing compound and the tungsten-containing compound comprises exposing said substrate to the boron-containing compound for a period of time, exposing said substrate to a pulse of the tungsten-containing compound, and exposing said substrate to a pulse of the boron-containing compound, and forming a bulk deposition layer on said nucleation layer by employing vapor deposition to bulk deposit a refractory metal contained in one of said boron-containing compound and tungsten-containing compound, as recited in proposed claim 23. Applicants respectfully request consideration of proposed claim 23 and allowance of proposed claim 23.

Thus, *Kang, et al.* (U.S. Patent No. 6,139,700) and *Kang, et al.* (U.S. Patent No 6,287,965), individually or in combination, do not teach, show, or suggest a method for forming a nucleation layer and a bulk deposition layer on a substrate disposed in a processing chamber, said method comprising forming a refractory metal nucleation layer by serially exposing said substrate to a boron-containing compound and a tungsten-containing compound, wherein serially exposing said substrate to the boron-containing compound and the tungsten-containing compound comprises exposing said substrate to a pulse of the boron-containing compound, exposing said substrate to a pulse of the tungsten-containing compound, and exposing said substrate to the boron-containing compound for a period of time, and forming a bulk deposition layer on said

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nucleation layer by employing vapor deposition to bulk deposit a refractory metal contained in one of said boron-containing compound and the tungsten-containing compound, as recited in proposed claim 26. Applicants respectfully request consideration of proposed claim 26 and allowance of proposed claim 26.

Claims 27, 28, and 29 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over *Kang, et al.*, (U.S. Patent No. 6,139,700), as applied to claim 1 above. Applicants submit that the rejection of claims 27, 28, and 29 is moot as Applicants propose canceling claims 27, 28, and 29.

Claim 30 stands rejected under § 103(a) as being unpatentable over *Kang, et al.*, (U.S. Patent No. 6,139,700), as applied to claim 28 above, and further in view of *Kang, et al.* (U.S. Patent No 6,287,965). Applicants submit that the rejection of claim 30 is moot as Applicants propose canceling claim 30.

Claims 31 and 32 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over *Kang, et al.* (U.S. Patent No. 6,139,700), as applied to claim 1 above. Applicants submit that the rejection of claims 31 and 32 is moot as Applicants propose canceling claims 31 and 32.

Claim 33 stands rejected under 35 U.S.C. § 103(a) as being unpatentable over *Kang, et al.* (U.S. Patent No. 6,139,700), as applied to claim 31 above, and further in view of *Kang, et al.* (U.S. Patent No 6,287,965). Applicants submit that the rejection of claim 33 is moot as Applicants propose canceling claim 33.

In conclusion, the references cited by the Examiner, alone or in combination, do not teach, show, or suggest the invention as claimed.

Having addressed all issues set out in the Final Office Action, Applicants respectfully submit that the claims are in condition for allowance and respectfully request that the claims be allowed.

Respectfully submitted,



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